alcohol, then spoke of the diatomic alcohols or glycols; but no one in the audience could have guessed that it was he who first gave an accurate interpretation to Berthelot's results, and that he followed up and confirmed his generalisation by the brilliant discovery of the glycols.

I cite but two cases out of many, for during the whole of his course Wurtz never alluded to one of his discoveries as being his own; and certainly from his own lectures his large audiences at the Sorbonne could have had no idea of the leading part he played in the grand development of modern organic chemistry.

Having already exercised his immense influence at the École de Médecine, he felt himself at too great a distance from his auditors at the Sorbonne, and while he was having a laboratory (still unfinished) built for him, he inaugurated last year a series of weekly *conférences*[1] under his own direction, which might well find their analogues in the English Universities. Each week M. Wurtz gave out two subjects (such as molecular weights, the paraffins, the ethers, &c.), and two students volunteered to give lectures (lasting from half an hour to three-quarters of an hour) on them the week following. The *conférences* were delivered in one of the large lecture-rooms to audiences of from sixty to eighty students; Wurtz himself sat at the end of the lecture-table and gave a kindly and helpful criticism after the *conférence* was over. The last of these *conférences* was given just three weeks ago by the writer of these lines, and M. Wurtz's kind words will always be a precious memory to him:—they were the last he was destined to utter in public.

Wurtz was a fine man, of commanding presence. To alleviate the organic disease from which he suffered, and from which he died, he began by his doctor's orders to work at gymnastics about ten years ago, and he was, notwithstanding his sixty-six years, an accomplished gymnast at the time of his death. The untiring activity of his mind appeared in a certain vivacity and restlessness of manner peculiar to himself; but one felt, as soon as one saw and spoke to him, that he was a straightforward, loyal-hearted gentleman.

M. Wurtz was followed to the grave not only by the official deputations from the Sénat, the Institut, and the various learned institutions with which he was connected, but also by hundreds of students, principally from the École de Médecine and the Faculté des Sciences, bearing, according to French custom, wreaths of flowers, and thus paid their last tribute to the memory of their loved master. One could not help noticing especially an immense wreath of white flowers, offered by the women-students of the Faculté de Médecine, as a testimony of their gratitude to the man who some fifteen years ago obtained permission for them to study in the Faculty, and whom they followed to his last resting place right across Paris from the Boulevard St. Germain to the cemetery of Père la Chaise.

The sympathy which M. Wurtz inspired in all with whom he came in contact, coupled with his great genius, gave him a personal influence beyond that of most men—for if he is dead to us in the body he is still living in the mind, aye, and in the hearts, of the thousands of students who have listened to him in rapt attention on the benches of the École de Médicine and of the Sorbonne. As he said of Dumas: *Forma mentis æterna.*

Paris, May 16

ROBERT ANGUS SMITH

ANOTHER of the men of the middle time has passed away. Early on Monday morning, the 12th inst., whilst Adolphe Wurtz lay dying at Paris, Angus Smith breathed his last at Glynwood, Colwyn Bay. Both men were of the same age, and both were pupils of the illustrious Liebig—students in the great chemical school of Giessen. Each, in a sense, was imbued with some one phase of the spirit of their many-sided master, but in a different manner: Wurtz spent his energies and won his greatest triumphs in the development of chemical theory, and in the elucidation of the structure of organic compounds; Smith had probably little knowledge of, and but little sympathy with, the theories of modern organic chemistry; and although possessed of his countrymen's love of metaphysics, and, as his writings show, capable of much abstract speculation, his conceptions of chemical constitution were probably, in the main, as mechanical as those of Dalton, whose disciple and chief interpreter he considered himself to be. His chief point of contact with Liebig lay in his recognition of the utilitarian side of his science: for upwards of forty years he laboured unceasingly to show how chemistry might minister to the material comfort and physical well-being of men—not in the manufacture of new compounds useful in the arts, or in the establishment of new industries,—but in raising the general standard of the health of communities by checking or counteracting the evils which have followed in the train of that enormous development of the manufacturing arts which is the boast of this century. Sweetness and light were fixed articles in Smith's creed. His love of fresh air, of pure water, of a green hillside was intense. "Where to, sir?" asked a cabdriver whom Smith had hailed on his way home, tired and longing for escape from beneath the dull, murky Manchester sky. "To the sun!" was the answer. And we are told that it was to the credit of that cabman that he did not take the old philosopher to some hostelry with the sign of Phœbus, but trundled him among the green lanes beyond the city's outskirts until it was time to turn the horse's head homewards. To keep the air in our towns fresh and wholesome, to restore the water of our streams to its pristine clearness, to preserve the freshness and verdure of the fields and woods, to sweeten the atmosphere of the crowded dwellings in cities,—this was the kind of work to which Smith dedicated his life, and at which he laboured to the very last. There have been greater chemists, no doubt; his name is not associated with any fundamental discovery in chemistry, and his attempts at theorising were not always very happy; but in his true vocation, as the chemist of sanitary science, Smith worked alone, and we have yet to find the man on whom his mantle has fallen.

Robert Angus Smith was born in the neighbourhood of Glasgow on February 15, 1817. When nine years of age, he was sent to the High School, and at thirteen he entered the University of Glasgow. He quickly showed that liking for the classics, and especially for Greek, which clung to him through life, and his mother, as usual among Scottish matrons, cherished the aspiration that her son should "wag his pow in a poopit." Whether this ambition was ever shared by her son is doubtful; at all events, such a career became impossible for Smith after hearing the preaching of Campbell of Row: he declared that he could not take "holy orders in a kirk which had expelled a man for being apparently both wiser and better than itself." On leaving the University he acted as tutor in various families in the Highlands and in London. What directed him towards science does not appear. In company with his brother John, who is known as the inventor of a chromoscope, and as the author of some speculations on the cause of colour and the nature of light, he had read the standard works of his time on natural philosophy and chemistry. When twenty-two years of age he found himself at Giessen, and after working under Liebig for some time he obtained his doctorate. He returned to England in 1841, and procured employment under Dr., now Sir Lyon, Playfair, in connection with the Health of Towns Commission. It was this circumstance which doubtless served to fix the direction of his future work. His earliest publication—a contribution to the then recently founded Chemical Society of London—was a paper on the air and

[1] I need hardly say all University lectures are quite free in France.

water of towns, and successive memoirs, with almost identical titles, made their appearance either in the Society's *Transactions* or among the Reports of the British Association. The Royal Society's Catalogue shows that Smith was the author of about thirty papers on air and water. These he eventually collected and published, with considerable additions, in the form of a thick octavo volume, entitled "Air and Rain, the Beginnings of a Chemical Climatology," with a dedication to his friend and teacher Liebig. This book shows Smith at his best and at his worst. It is full of facts and quaint out-of-the-way references; on the other hand, it is diffuse, and, as a piece of literary work, badly put together—faults difficult to avoid in a compilation based upon, or largely composed of, papers already published. That Smith had considerable literary skill, and a sound critical faculty, may be seen in the short memoir on Graham prefixed to the collection of that philosopher's papers brought together and published, with a reverential care, by the late Dr. James Young of Kelly. Smith had years before saturated his mind with the notions of the Hellenic atomists, even before the time he wrote his monograph on Dalton, and in this short prefatory memoir of some twenty pages he crystallises out his thoughts on the development of the atomic systems of Kapila, Leucippus, Lucretius, Newton, and Dalton, and shows with admirable lucidity Graham's true relation to these great thinkers. Smith, however, would never have made a good teacher, despite his wish, in early life, to connect himself with some place of higher chemical instruction. When at his best he was not an ineffective speaker; but he was wanting in power of exposition, and his metaphysical tendencies and his quaint playful fancy were only too apt to disturb the even tenor of a sustained description, or closely reasoned argument. No man, however, was more popular among young men, for he had a genuine sympathy with youthful aspirations, and a kindly way of drawing out and encouraging what was good in them, and there are dozens of men still living who have to thank the gentle, quiet-spoken philosopher and friend for their first step in life. He had, too, his countrymen's tenacity of friendship: it took a very violent wrench indeed to disturb a confidence once placed.

From 1842 Smith was closely connected with Manchester. In that year he settled himself in the town as a consulting chemist. Shortly afterwards he became a member of the Literary and Philosophical Society of Manchester—a society made famous by its connection with Dalton and the Henrys—and much of his work appears in the *Memoirs* and *Proceedings* of that body. In 1855-56 he became one of its honorary secretaries, in 1859 a vice-president, and in 1864-65 president. In his "Centenary of Science in Manchester," published a short time ago, he has sketched, in characteristic manner, the growth of that institution, and has sought to trace its influence on the development of scientific life in Lancashire.

In 1863 Smith was appointed Inspector-General of Alkali Works for the Government, and the somewhat delicate task of initiating the working of Lord Derby's Act fell to him. He performed this duty with characteristic tact and with every desire to avoid undue interference with the legitimate business of the alkali maker. The successful working of that Act is largely due to the manner in which Smith and his subordinates set it in operation. On the passing of the Rivers' Pollution Act he was made Inspector for England, and afterwards for Scotland. He held both these appointments up to the time of his death.

Angus Smith had a passionate delight in the Highlands, and the smell of a peat fire was to him as incense. He had something, too, of the Highlander's love of mysticism in his composition, and throughout his life he found pleasure in Celtic literature; and it was with a mind well stored with legends that he produced "Loch Etive and the Sons of Uisnach," published anonymously in 1879.

Smith lived the "quiet life" of Pope's philosopher. His temper was singularly even and placid: he had his checks and crosses, of course, like other men, and he was occasionally pained to find himself misunderstood. But nothing ruffled his calm. His perfect transparency, his charming simplicity, and a certain quiet playfulness of manner gained for him the sobriquet of "Agnus" Smith. Indeed, his sense of fun could see the latent humour in any situation. Even on his death-bed it was with him. Somebody had said that they were not going to part with him yet. "You will be clever people," he rejoined, with the old twinkle in his eye, "if you keep me here three days longer."

Smith became a member of the Chemical Society in 1845, and a Fellow of the Royal Society in 1857, and in 1882 the University of Edinburgh conferred the honorary degree of LL.D. upon him.

T. E. THORPE

NORWEGIAN GEODETICAL OPERATIONS[1]

THE first part of this publication, published in 1882, was reviewed in NATURE, February 8, 1883. The second part, now before us, consists principally of a series of tables giving the results of the observations at the following tidal stations:—Stavanger from 1881 to 1882, Throndhjem from 1880 to 1881, Kabelvaag from 1881 to 1882, and Vardoe from 1880 to 1882. These tables are arranged precisely as in the first part; it is therefore unnecessary to refer to them more particularly.

A description, accompanied by a drawing, is given of the self-registering apparatus used. The float, placed in a tube, is connected by means of a fine wire to a wheel 50 cm. diameter, and the wire is kept taut by a counterweight acting on a second concentric wheel. On the axis of these wheels, and rigidly connected to it, is a pinion 2·5 cm. effective diameter, working on a horizontal rack, to which the scribing pencil is attached. Thus the rise and fall of the tide is measured to a scale of $\frac{2\cdot5}{50}$ or $\frac{1}{20}$. A cylinder, on which is fixed the diagram paper ruled with hour lines, is placed horizontally below the rack, and is driven by a clock connected to it directly by means of gearing, and assisted by a weight attached to a string passing over a pulley. This apparatus is the invention of Lieut.-Col. Haffner, and is made by a watchmaker (G. P. Stenberg) at Bergen.

It is mentioned that, owing to a defect in the self-registering apparatus used at Oscarsborg and at Drontheim, and described in the first part, the observations are not as satisfactory as might be wished. In the instruments used at these stations the motion of the driving clock was communicated to the diagrams by means of a string, and it has been found that the variations in the amount of humidity and of temperature sufficiently affected the length of the string to cause appreciable errors. It should be understood that the readings were taken by means of hour lines ruled on the diagram paper; any alteration in the length of the string clearly affects the accuracy of the position of these hour lines. This source of error has been removed, and new observations taken, which will be published in a succeeding part.

SATURN

MESSRS. PAUL AND PROSPER HENRY contribute to *La Nature* some interesting information on the recent aspect of the planet Saturn. During the month of February and the beginning of March last

[1] Publication of the Norwegian Committee of the Association for the Measurement of Degrees in Europe, Part II. (Christiania, 1883.)